(August 7, 2006)

Concrete Block Faced Structural Earth Wall Materials

General Materials

Concrete Block

Acceptability of the blocks will be determined based on the following:

1. Visual inspection.

2. Compressive strength tests, conforming to Section 6-13.3(4).

3. Water absorption tests, conforming to Section 6-13.3(4).

4. Manufacturer's Certificate of Compliance in accordance with Section 1-06.3.

5. Freeze-thaw tests conducted on the lot of blocks produced for use in this project, as specified in Section 6-13.3(4).

6. Copies of results from tests conducted on the lot of blocks produced for this project by the concrete block fabricator in accordance with the quality control program required by the structural earth wall manufacturer.

The blocks shall be considered acceptable regardless of curing age when compressive test results indicate that the compressive strength conforms to the 28-day requirements, and when all other acceptability requirements specified above are met.

Testing and inspection of dry cast concrete blocks shall conform to ASTM C 140, and shall include block fabrication plant approval by WSDOT prior to the start of block production for this project.

Mortar

Mortar shall conform to ASTM C 270, Type S, with an integral water repellent admixture as approved by the Engineer. The amount of admixture shall be as recommended by the admixture manufacturer. To ensure uniform color, texture, and quality, all mortar mix components shall be obtained from one manufacturer for each component, and from one source and producer for each aggregate.

Drainage Geosynthetic Fabric

Drainage geosynthetic fabric shall be a non-woven geosynthetic conforming to the requirements in Section 9-33.1, for Construction Geotextile for Underground Drainage, Moderate Survivability, Class B.

Backfill for Concrete Block Faced Structural Earth Wall

All backfill material within the structural earth wall reinforced zone shall be free draining, free from organic or otherwise deleterious material.

Backfill material within the reinforced zone shall conform to Section 9-03.14(1), except that the maximum particle size for walls with geogrid reinforcement shall not exceed 1-1/4 inches.

All material within the structural earth wall reinforced zone shall be substantially free of shale or other soft, poor durability particles, and shall not contain recycled materials, such as glass, shredded tires, portland cement concrete rubble, or asphaltic concrete rubble. The material shall meet the following aggregate durability requirements:

Property	Test Method	Allowable Test Value
Los Angeles Wear, 500 rev.	AASHTO T 96	35 percent max.
Degradation	WSDOT Test Method 113	15 percent min.

For walls with metallic soil reinforcement, all material within the structural earth wall reinforced zone shall meet the following chemical requirements:

Property	Test Method	Allowable Test Value
Resistivity	AASHTO T 288	3,000 ohm-cm, min.
pH	AASHTO T 289	5 to 10
Chlorides	AASHTO T 291	100 ppm max.
Sulfates	AASHTO T 290	200 ppm max.

If the resistivity of the backfill material equals or exceeds 5,000 ohm-cm, the specified chloride and sulfate limits may be waived.

For walls with geogrid soil reinforcement, all material within the structural earth wall reinforced zone shall meet the following chemical requirements:

Property	Test Method	Allowable Test Value
pH	AASHTO T 289	4.5 to 9

Wall backfill material satisfying these gradation, durability, and chemical requirements shall be classified as nonagressive.

Proprietary Materials

KeySystem I Wall

Reinforcing strips shall be composed of welded wire fabric strips conforming to AASHTO M 55 with wire conforming to AASHTO M 32, and attached to block connector plates conforming to ASTM A 36. Reinforcing strips and block connector plates shall be galvanized after fabrication in accordance with AASHTO M 111. Damage to galvanizing shall be repaired with one coat of Formula A-9-73 paint conforming to Section 9-08.2.

Block alignment pins shall be fiberglass conforming to the requirements of Keystone Retaining Wall Systems, Inc.

Block connector pins shall conform to AASHTO M 32, and shall be galvanized after fabrication in accordance with AASHTO M 111.

Mesa Wall

Tensar Geogrid Materials

Geogrid reinforcement shall conform to Section 9-33.1, and shall be a product listed in Appendix D of the current WSDOT Qualified Products List

(QPL). The values of T_{al} and T_{ult} as listed in the QPL for the products used shall meet or exceed the values required for the wall manufacturer's reinforcement design as specified in the structural earth wall design calculation and working drawing submittal.

The minimum ultimate tensile strength of the geogrid shall be a minimum average roll value (the average test results for any sampled roll in a lot shall meet or exceed the values shown in Appendix D of the current WSDOT QPL). The strength shall be determined in accordance with ASTM D 6637, for multi-rib specimens.

The ultraviolet (UV) radiation stability, in accordance with ASTM D 4355, shall be a minimum of 70 percent strength retained after 500 hours in the weatherometer.

The longitudinal (i.e., in the direction of loading) and transverse (i.e., parallel to the wall or slope face) ribs that make up the geogrid shall be perpendicular to one another. The maximum deviation of the cross-rib from being perpendicular to the longitudinal rib (skew) shall be no more than 1 inch in 5 feet of geogrid width. The maximum deviation of the cross-rib at any point from a line perpendicular to the longitudinal ribs located at the cross-rib (bow) shall be 0.5 inches.

The gap between the connector and the bearing surface of the connector tab cross-rib shall not exceed 0.5 inches. A maximum of 10% of connector tabs may have a gap between 0.3 inches and 0.5 inches. Gaps in the remaining connector tabs shall not exceed 0.3 inches.

The Engineer will take random samples of the geogrid materials at the job site. Approval of the geogrid materials will be based on testing of samples from each lot. A "lot" shall be defined as all geogrid rolls sent to the project site produced by the same manufacturer during a continuous period of production at the same manufacturing plant having the same product name. The Contracting Agency will require 14 calendar days maximum for testing the samples after their arrival at the WSDOT Materials Laboratory in Tumwater, WA.

The geogrid samples will be tested for conformance to the specified material properties. If the test results indicate that the geogrid lot does not meet the specified properties, the roll or rolls which were samples will be rejected. Two additional rolls for each roll tested which failed from the lot previously tested will then be selected at random by the Engineer for sampling and retesting. If the retesting shows that any of the additional rolls tested do not meet the specified properties, the entire lot will be rejected. If the test results from all the rolls retested meet the specified properties, the entire lot minus the roll(s) which failed will be accepted.

All geogrid materials which have defects, deterioration, or damage, as determined by the Engineer, will be rejected. All rejected geogrid materials shall be replaced at no expense to the Contracting Agency.

Except as otherwise noted, geogrid identification, storage and handling shall conform to the requirements specified in Section 2-12.2. The geogrid materials shall not be exposed to temperatures less than –20F and greater than 122F.

Block connectors for block courses with geogrid reinforcement shall be glass fiber reinforced high-density polypropylene conforming to the following minimum material specifications:

Property	**Specification**	**Value**
Polypropylene	ASTM D 4101	
	Group 1 Class 1 Grade 2	73 ± 2 percent
Fiberglass Content	ASTM D 2584	25 ± 3 percent
Carbon Black	ASTM D 4218	2 percent minimum
Specific Gravity	ASTM D 792	1.08 ± 0.04
Tensile Strength	ASTM D 638	
at yield		8,700 ± 1,450 psi
Melt Flow Rate	ASTM D 1238	0.37 ± 0.16 ounces/10 min.

Block connectors for block courses without geogrid reinforcement shall be glass fiber reinforced high-density polyethylene (HDPE) conforming to the following minimum material specifications:

Property	**Specification**	**Value**
HDPE	ASTM D 1248	
	Type III Class A Grade 5	68 ± 3 percent
Fiberglass Content	ASTM D 2584	30 ± 3 percent
Carbon Black	ASTM D 4218	2 percent minimum
Specific Gravity	ASTM D 792	1.16 ± 0.06
Tensile Strength	ASTM D 638	
at yield		8,700 ± 725 psi
Melt Flow Rate	ASTM D 1238	0.11 ± 0.07 ounces/10 min.